BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF DELAWARE

PSC DOCKET NO. 06-241
REVIEW AND APPROVAL OF THE REQUEST FOR PROPOSALS FOR THE CONSTRUCTION OF NEW GENERATION RESOURCES UNDER 26 DEL. C. § 1007(d)

PRELIMINARY REVIEW OF STATE AGENCIES' EVALUATION OF PROPOSALS

Willett Kempton and Jeremy Firestone
5 March 2007 (subject to revision)

Background

In response to a request for proposals (RFP) for new electric power in Delaware, three companies submitted bids. The power would be used for "standard offer service" or "SOS" customers, who are essentially residential customers getting a bill from Delmarva Power and Light (DP&L). The 21 Feb 2007 "Report on Evaluation of Bids…" by consultants working for the state gives an evaluation, a ranking, and a good deal of discussion of these bids. That report is written by paid consultants, and will be used as input to a decision, although it does not by itself carry any legal standing. Four agencies will decide what action to take, following guidelines set by a 2006 Delaware law, HB6. There is also a consultant report prepared for Delmarva Power. This review focuses more on the State Agencies' consultant report (hence "State consultant") as it appears to be the more considered treatment, and per HB6, it is the State Agencies that have the power to decide which if any bid(s) to accept. However, both sets of consultants collaborated in the evaluation and shared some input values; for some those values the State consultant relied on work undertaken by Delmarva's consultant.[1]

First we review major parts of the bid scoring by the consultants, with only minimal comment. Then we review some of the other aspects of the bids that we feel were not highlighted very well in the consultant reports.

Total point allocation

A point system was established by the PSC and DNREC. The total points are a simple measure that gives an overview but glosses over critical details about how these points

[1] The reliance on Delmarva's consultant for the basis of the price comparison could be problematic given the possibility of self-dealing as (a) one of the three bidders is Conectiv, an affiliate of Delmarva Power (while some measures were taken to protect against this possibility, it does not eliminate all concerns in that regard) and (b) Delmarva Power has shown little enthusiasm for the bidding process.

were determined, as discussed below in this document. Each of the three bidders provided several variants of their bid; here we focus on the few variants also highlighted by the consultants. The names of those bids are: Bluewater Wind (BWW) North 600 MW, 25 yr full bid; NRG without carbon capture and storage (CCS), 25 year bid; NRG with CCS; and Conectiv Alternative bid). For these bids, the rankings of the two evaluations are:

Table 1. Consultant Bid Scoring

	State Agencies	Delmarva
Conectiv	68.9	66.7
BWW	57.0	50.4
NRG no CCS	24.8	20.2
NRG w/ CCS	23.8	Not Rated

These point ratings, and equally important, the individual components of each, are to be used by the four agencies to inform their judgment in making a decision.

Price Scoring

The PSC and DNREC assigned "Expected price" the largest number of points (33 out of 100) in the overall rating. The bid prices (with adjustments) and points are shown below for the State consultant; the Delmarva consultant scores are similar.

Table 2. State Consultant Price Scoring

	Expected Price	Price points
Conectiv	$87.48	33.0
BWW	$98.21	8.3
NRG no CCS	$101.37	1.1
NRG CCS	$117.07[2]	0

The best bid (lowest price) gets full 33 points and the middle bid (BWW) gets 8.3 (the State consultant's calculations are explained on page 34 of its report). The reason for the wide range in points received was the scaling choice that Delmarva employed--and which the State consultant followed--where for each dollar that a bid was above the lowest bid, it lost slightly more than two points. This is a complex and arbitrary scheme that arose because Delmarva failed to undertake the required test bid. Other ranking scales would have resulted in different price points and some would have altered the overall rankings of

[2] This is from the Delmarva consultant's evaluation, which ran about $6/MWh higher than State evaluation on coal costs. The $117.07 was not given in State report. For comparison with the other State consultant numbers, NRG with CCS would be roughly $111.

the bids.[3]

Price Stability

The measure of "price stability" was the primary motivation of HB6. It is a measure of the risk of future large price increases due to factors such as further large fuel price increases, larger than now forecast CO_2 taxes or restrictions, etc. Thus, a better name than "price stability" might be "low risk of price increases".

The above price analysis is based on assumptions and forecasts about future costs and policies. On price stability, these unknown future factors were varied, to measure their effect on price. An important factor in these scores was that both fossil fuel bidders proposed to pass part or all of future fuel price increases, and future CO_2 costs, on to Delmarva and thus to the ratepayers. Price stability scores are shown below.

Table 3: State Consultant Price Stability Scoring

	Price stability points
Conectiv	0.7
BWW	20
NRG no CCS	0
NRG CCS	0

To calculate price stability, the State consultant examined what impact the bid, if accepted, would have on long-term rate stability. While each of the BWW bids in isolation is completely price stable, because each would account for only a portion of the power that would be supplied to residential ratepayers, each will provide significant, but not total, long-term price stability to rates. The amount of overall price stability afforded varies with the amount of power that would be provided in each of the BWW bids. In comparison, the Conectiv bid was deemed only marginally better than relying on the market, while the NRG bids, were actually viewed as adding further instability to the system. Given that those bids would add little or no stability to prices, the rightfully received zero or near-zero point allocations. This method of examining a bids effect on the overall rates makes sense and raises the question of why it was not employed with the price analysis (we discuss this in more detail below).

Environmental impact

Reduction in environmental impacts was also scored, but got fewer points than price and

[3] Had bids instead lost 1 point for each dollar above the lowest bid, BWW would have been awarded approximately 22 points, and NRG without CCS approximately 19 points. Or if instead of the chosen scheme, price points were discounted by the percentage above the lowest bid, BWW would have lost 12.2% of the bid points, and NRG 15.9%, resulting in BWW being awarded 29 price points and NRG without CCS, 27.8 points.

was scaled differently from the price. Global warming was only 4 of the 14 points awarded for reduction in environmental impacts, but we list it separately here to underscore the peculiar scoring of environmental points.

Table 4. State Consultant Environmental Points

	Global warming points	Other environmental points	Total environmental points
Conectiv	2.1	8.2	10.3
BWW	4	7.8	12.2
NRG no CCS	0.3	6.3	6.6
NRG CCS	2.4	5.8	8.2

The negative environmental and human health effects of the two fossil sources are far worse than that of BWW. BWW produces no greenhouse gases during operation, while Conectiv's bid is business as usual, yet, Conectiv somehow receives more than half the possible global warming points. Even more perplexing is the comparison among the bids when the global warming points are subtracted out. Here, Conectiv's natural gas bid is actually rated superior to BWW' wind bid, with NRG's coal bid not very far behind. This suggests that there were problems in the way in which the environmental points were awarded or scaled. This also illustrates the differences in scaling between the expected price scale, which is more "all or none", and the environmental scale.

First cut evaluation

Thus, without evaluating anything more about the bids, and accepting all projected prices and point scores as given by the consultants, the above can be used to evaluate differing aspects of the bids. On the basis of lowest expected price, one would pick the Conectiv bid. By contrast, on the basis of either lowest risk of price increases, lowest human health and environmental impacts, or lowest risk of climate change damage, the Bluewater Wind bid would be picked.

In the following, we add analysis and comparisons not complete or not tabulated in the consultant reports.

Bill Impact

Neither consultant report analyzed the effect of the bids on individuals' monthly electric bills. Delmarva's consultant presented very large dollar figures of the total amount that would be spent by all customers over the 25 year contracts, which makes every contract seem overly expensive. The State consultant came closer by giving a simple monthly bill figure by which a bid was over the market rate, but incorrectly assumed that all SOS (residential) power would come from the new source. Here we calculate more realistic monthly costs, but based only on the consultant's total cost figures.

Delmarva presently supplies on average 413 MW to SOS customers, and estimates that by 2015, the average will be slightly more than 447 MW. All the bids are for smaller amounts. For example, the Bluewater North Partial Bid is estimated to supply on average 131MW, or slightly less than 30% of the 2015 load. Thus, if the partial bid were to be $10/MW over the market case, it would only result in on average a $3/MW increase, or, for a typical 1000 KWh/month user, a $3 or 2% of today's average electricity bill. Recalling that this RFP process was stimulated by a 60% increase in bills, some might consider a 2% increase modest in order to dampen future bill increases.

Table 5: Bids' Effect on Consumer Bills

	Average power from bid (MW)	% of SOS power in 2015 from bid	% bill increase
Market	447[4]		
Conectiv	177[5]	40%	0.35%
Bluewater Full	180[6]	40%	3.65%
Bluewater Partial	131[7]	29%	3.34%
NRG25 (400MW)	340[8]	76%	7.96%
NRG25 (280 MW)	238[9]	53%	5.57%

[4] Current average SOS customer usage is 413 MW. We use 447 MW for comparison sake here as it reflects Delmarva's projected average usage in 2015.

[5] Assumes 100% capacity factor; the capacity factor would in fact be lower, but since the bid price is close to the assumed market price, this would make little difference.

[6] Based on 197 MW average if Delmarva purchases all of the power generated from the 200 turbine offshore wind farm. This figure comes from the Delmarva consultant report and accounts for the fact that 600MW of installed wind power will result in 197 MW on average delivered to Delmarva. Bluewater's "Full" bid is a bit of a misnomer, as it in fact represents not the full power, but all the power from each of the 200 turbines, but capped at 400MW at any one time. We preliminarily (subject to further evaluation) estimate that the cap would result in an average production of approximately 180MW of generation from the 197 MW figure reported in the Delmarva consultant report.

[7] Bluewater Partial is all the power from 400 MW of installed capacity. Calculated as 2/3 of 197MW.

[8] Assumes that Delmarva will purchase all of the power from 400MW of the installed capacity, and that the capacity factor is 85%.

[9] Assumes that Delmarva will decide to ramp down the NRG plant 100% of the time to 280MW, as permitted in the NRG Bid.

Given that the legislation was enacted to combat the recent bill increases, it would seem appropriate to scale the bids based on their impact on consumer bills. Moreover, such an approach is consistent with the approach employed by the State's consultant in regard to price stability, where it looked not at the stability of the bid by itself, but rather, at the impact the bid would have on overall price stability. Interestingly, while the BWW partial bid is in isolation slightly more expensive than the BWW full bid, because it will contribute a smaller share of the total SOS load, it actually has a slightly smaller effect on bills.[10] This highlights as well the problem with the way in which the State consultant and Delmarva analyzed the bids.

It should be noted as well that because the calculated carbon fees were levelized while the actual price of carbon is expected to rise over time, the Bluewater bids will raise rates by more than the average 3.65% (or 3.34%, depending on the bid) in the early years of operation, while they will raise rates by less than average percentage amounts in the later years (presumably, the NRG bids will have the opposite effect). Again all this discussion of raising bill costs makes assumptions about a future in which energy prices and carbon costs are as predicted by the consultants, who shared most assumptions on the future; if either goes up substantially, the no-carbon bid would be the least expensive of the three.

Are the consultants' future projections reasonable?

The above analysis is based on the assumptions used in the State Consultant's report. Unfortunately, the State's consultant, while referred to as the "independent consultant" was not truly independent because, due to time constraints on this initial analysis, it was forced to rely on many of the assumptions developed by Delmarva's consultant. Two items in particular need further scrutiny--the assumption that natural gas prices will be relatively flat (again, remember the recent 100 increase in supply costs) and that the expected price for CO_2 emissions will be $12.1 per ton. Here, we address the latter concern.

The State Consultant's report suggests that CO_2 cost estimates used by it and Delmarva are low, and suggests that more appropriate estimates may be found in a report by an economic consulting firm, Synapse Energy Economics (State Consultant report, at footnote 32).[11] Given that the State has recently selected Synapse to assist it with the Integrated Resource Plan (IRP) analysis, we redo the analysis with the Synapse numbers. The middle estimate of Synapse is $19.6/ton, while the high estimate is $30.8/ton. Thus, the numbers used in both consultants' initial evaluations are indeed underestimates.

[10] Returning briefly to the question of point scores for price, none of these bids (save perhaps IGCC with sequestration) seems so inappropriate on price effect grounds that they should receive no points let alone less than half the points awarded price.

[11] http://www.synapse-energy.com/Downloads/SynapsePaper.2006-06.Climate-Change-and-Power.pdf.

Conectiv's project would first displace existing natural gas then coal. Thus, while a higher carbon charge would increase the cost of the Conectiv bid, its bid would become only marginally worse as compared to the market case than it is under the existing assumptions (as increases in carbon charges would increase the market case as well). NRG's total carbon emission bid would presumably fare worse compared to the market case. Based on eyeballing Figure 2 of the State consultant report, it would appear that a doubling of the price of carbon would add about $7/MWh to its 25 year bid. On the other hand, NRG's proposal to capture and attempt to sequester up to 65% of the carbon to be emitted would be increasingly attractive, at least compared to its total carbon emission option (it would increase in price as well because at least 35 percent of the carbon would remain uncontrolled and subject to the higher carbon price). Unfortunately, we are unable to analyze the impact on NRG's bids more precisely at this time because NRG has refused to release to the public information related to the feasibility of sequestering carbon in deep aquifer below Delaware. From the un-redacted fragments, they appear to believe it is possible but requires more research, have not committed to doing so in the bid, and will add to the electric charges any cost of doing so.[12]

Because an offshore wind power project would not emit any CO_2 during operation, BWW's bids look increasingly attractive when the Synapse analysis is employed, as the market price increases between $5 and $17/MWh depending on whether the middle or high CO_2 price is used and whether the Delaware (which is higher) or the U.S, average CO_2 emissions/MWh are employed. But what we can say is that with the Synapse carbon forecasts, the Bluewater bid prices would be within the range of raising rates on average 2 percent per year or decreasing them by 1 per cent per year over the 25 year life of the project.

Failure to consider marginal effects of new power on market prices

Any economic evaluation also should consider that a new large power facility will reduce locational marginal pricing, with financial benefits to customers. The hourly market bidding process means that adding a new block of power in Delaware will obviate the need for some power that is now bid at the highest price and used. Thus, any of these bids will lower market prices of electricity for all customers in the region, including SOS customers. For similar reasons, both the coal and wind bids would lower natural gases prices on the margin, whereas the Conectiv bid would create new demand for natural gas and raise gas prices. These are important effects, especially on the market clearing price of electricity, and are not considered by either consultant. Thus all aggregate cost estimates, especially for the coal and wind bids, are too high.

There is also very little consideration of health effects, which seems odd since this was one motivation of the RFP in the first place. The reason the consultants said nothing about this is that the PSC and consultants interpreted "environmental improvement", as

[12] Hopefully, through the current process to require and review justifications for not disclosing information to the public, this information will be forthcoming soon.

giving most weight to the natural world, rather than the health costs of pollution. Health was considered via point scores for criteria pollutants, but with weighting far below their actual cost in health care, lost work days, etc. A more quantitatively accurate way to include health costs would be to take the cents/kWh figures on health costs of varying electric sources and include this in the price figures. We have not carried out such an analysis in this document but it should be part of any decision. We expect that a quantitatively accurate accounting of health costs would show the wind bids to be cheapest in dollar terms, even without considering environmental or global warming costs.[13]

Customer bill impact and customer preference

Generally, consumers want to obtain the lowest price for the same product. But across bids, are we comparing the same product? By chance, we have data on how Delmarva customers evaluate choices similar to those being considered.

A University of Delaware survey was made of the state power preferences, by the authors of this document and by a Ph.D. student, Andrew Krueger. (http://www.ocean.udel.edu/windpower/docs/DE-survey-InterimReport-16Jan2007.pdf). The survey was designed and conducted before the RFP process, so it does not exactly match the choices among these bids.

Survey respondents were asked to choose among power options that included two offshore wind proposals with varying degrees of visual impact and varying prices versus additional power from natural gas or coal[14] power at no change in price and no ocean view impact. They were asked to make this comparison three times, each time with different wind power attributes. As reported previously, when we combine all the wind options that cost between $1-30 more per month for the first three years, 91% preferred one of the offshore wind options rather than electricity from coal or natural gas.

We have in this report more precisely separated out Delmarva customers (599 of the 931 respondents who identified an electric provider, and looked in more detail at the simplest comparison where only (a) the initial price (the same as the coal or natural gas option or $1-30 more per month for the first three years); (b) the distance from shore varied between the two wind power options; and (c) both wind power options were in the ocean off the southern part of Delaware. We then considered only those options, where the

[13] For the additional health costs of global warming, see Jonathan A. Patz, Diarmid Campbell-Lendrum, Tracey Holloway and Jonathan A. Foley, 2005, Impact of regional climate change on human health, Nature, 438(7066) p. 310, doi:10.1038/nature04188. For impact of global warming and sea level rise on the Delaware coast, see http://co2.cms.udel.edu/.

[14] We asked about an unspecified coal generator, not a coal gasification generator that might capture and sequester up to 65% of the carbon, so the comparison is imperfect but arguably, not very different from natural gas.

price of one wind option was either $10 or $20 per month and the other $20 or $30 per month (227 Delmarva Power respondents received one of these options). Even at these higher prices ($10-$30/month), 89 percent favor a wind option to coal or natural gas, with the selected wind option averaging approximately 7 miles from shore. This suggests that the public would be supportive of a slight increase in electricity rates to support the adoption of a wind power project.

Table 6. Delmarva Customers' Energy Source Preferences

	Same price for one wind option	$10 - $30 more for wind	$20 - $30 more for wind
Prefer coal or gas	5%	11%	15.5
Prefer wind	95%	89%	84.5

To recap, we previously calculated the bill impact, taking the State consultant's assumptions--energy prices and CO_2 penalties are those assumed by Delmarva (that is, CO_2 costs are approximately 50% less than the Synapse mid-range price). Under these assumptions, the monthly impact on bill is $3 for offshore wind and a little over twice that for coal with sequestration. Then we compare the expected bill impact with what Delmarva customers are willing to pay for clean power using the UD survey.

Delmarva customers have clearly spoken their preferences among the choices offered by the bidders. The survey evidence is compelling, and seems to be supported by the very high degree of public interest in this bidding process. Delmarva customer preferences are also consistent with the language embedded in Delaware law (HB 6, see below), State policy as set forth in the Regional Greenhouse Gas Initiative (RGGI) and the renewable portfolio standard. It is also consistent with forward-looking industry analysis of the power sector (e.g., by organizations such as EPRI and the Edison Electric Institute), which now advise against a generation portfolio of 100% CO_2 producing fuels.

The preferences of Delmarva residential customers are also relevant to the debate over whether or not it is "fair" for them to pay a little more for clean power that will benefit the entire state. Although this is a good policy debate, we have shown that Delmarva SOS customers have said that they would like to do so. From prior rate hearings, we would not count on large electricity customers to agree so widely on this. Given that we have a process and bids in hand, that SOS customers have said they want this, and that large electricity buyers may well choose differently, the argument that it is unfair to SOS customers is not convincing.

Using HB 6 criteria

HB6 specified that the evaluation criteria for the bids should be set up based on primarily: rate stability, reductions in environmental impact, and the benefits of adopting new technology (the other two factors—siting feasibility and terms of sale—we would expect any acceptable bid to achieve and do not tabulate here). We sum them as just a "simple sum", weighted by the points of each:

Table 7. Bid Scoring Using HB6 Criteria

	Price stability	Environment	Technology	Sum
Conectiv	0.7	10.3	0.0	11.0
BWW Full	20.0	12.2	3.0	35.2
NRG no CCS	0.0	6.8	3.0	9.6
NRG (w/CCS)	0.0	8.2	3.0	11.7

Thus, if we take the criteria emphasized in the law, and the state consultant's scoring points as given, the highest ranked bid by a 3:1 ratio is BWW. Interestingly, even NRG's carbon sequestration bid slightly outranks Conectiv. Also, coal with sequestration is ranked above coal without sequestration. These rankings, based on the criteria explicit in the law, seem more consistent with the discussions as HB6 was being created.

Other issues

Delmarva Power has expressed some concerns about the bids, which we feel should be addressed concurrently with bid selection. We suggest potential remedies as examples, without recommending any particular ones.

Delmarva is concerned about having to purchase more power than it needs at certain times of the day and year. There seem to be several ways to accommodate this concern. First, HB6's requirement for 30% market purchases should not apply at every single hour but rather, should be averaged out over all 8760 hours of the year. This reasonable interpretation would, eliminate much of the oversupply problem. For the remaining times of oversupply, Delmarva should be allowed other mechanisms than resale, for example, it could supply that excess power to non-SOS customers at the prevailing energy rate, with any price differential put on the wires charge. Due to load growth, excess generation will shrink through time. An alternative to the prior mechanisms would be that the State could select smaller of alternative bid options proposed (e.g., BWW's partial bid)

Delmarva also has expressed concern that its customers may migrate to other power providers if the new bid power is more expensive than competing suppliers. Our survey results suggest if anything wind power will not only help Delmarva retain its present customer base, but to draw in additional customers as well. Nevertheless, given that Delmarva is concerned about this prospect, given that only 1% of Delmarva residential customers are using an alternative power provider, and given that with HB6, the state is making requests of Delmarva potentially inconsistent with customer choice, it may be time to revisit whether it makes sense to continue to require Delmarva to offer customer choice.

The risks of "no bid". Some have proposed accepting no bid as a safe choice. We urge those proposing no bid to consider that: 1. Accepting no bid will mean forgoing the emissions reductions that begin from day one of operation of a clean facility, and which will save lives and reduce environmental destruction every month it is operated. 2. An RFP with a long-term power purchase contract is the ideal instrument for advanced technologies, whether IGCC or offshore wind. The bidding process worked to bring

down the price, with this offshore wind bid being the lowest we know of on a per MWh basis. Why would we create the same process another time if we have at least one viable bid right now? 3. It is easier to make any regulatory adjustments needed now than to restart the whole bidding process; a restart also imposes large financial and management costs on both the state and the firms that have participated in good faith. 4. Although economic development is not part of the explicit criteria, both offshore wind and IGCC are likely to be expanding businesses. Offshore wind is a huge resource in Delaware and our entire region. Delaware has a substantial advantage in creation of businesses and jobs that will be lost or reduced if we stop now and wait until neighboring states step ahead and past us. 5. Delaware is severely threatened by climate change, especially due to sea level rise. If we refuse to take a step to address climate change—when a major step forward is offered to us so painlessly—how will we explain our inaction to our children and grandchildren? 6. Even if we accept the consultants' numbers that an accepted bid will increase electricity rates modestly, the question becomes whether that increase (that is, that insurance premium) is worth the long-term benefits of stable prices and reduced environmental and health impacts.[15] We have presented evidence here that it is.

[15] Delmarva frames the question almost the same way noting that the weighting of points is to, "in Delmarva's view, award points to bidders that achieved the economic objective of the Act: energy price stability in a cost-effective manner."